Monitoring PRRS sero-prevalence in Danish breeding herds

Evaluation of algorithms performance

Lopes Antunes, Ana Carolina; Dorea, Fernanda ; Hisham Beshara Halasa, Tariq; Toft, Nils

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Monitoring PRRS sero-prevalence in Danish breeding herds: Evaluation of algorithms performance.

Ana Carolina Antunes[1], Fernanda Dórea[2], Tariq Halasa[1] , Nils Toft[1]

What is the current situation in Denmark?

- Porcine reproductive and respiratory syndrome (PRRS) is endemic.
- Serology tests are compulsory in breeding herds as one of the components of the PRRS surveillance programme.
- There is an increasing motivation to control PRRS to optimize production and to increase the value of traded pigs.

What was the objective?

To provide a preliminary assessment of the performance of aberration detection algorithms applied to the results of the PRRS serology testing in breeding herds.

How did we do it?

A. Data management

- Herds were classified as **PRRS+** if at least 2 individual blood samples were positive in a given testing. Data were analysed from 2007 to 2014.
- The weekly PRRS-seroprevalence was calculated as:

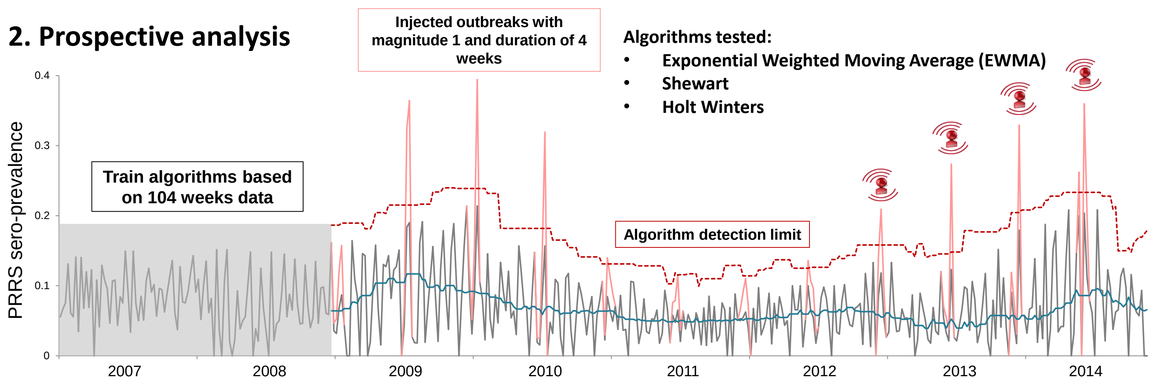
$$\text{PRRS sero} - \text{prevalence}\ (w) = \frac{Nr\ of\ PRRS+\ herds\ (w)}{Total\ herds\ tested\ (w)}$$

B. Time-series analysis

1. Retrospective analysis

- No temporal effects that could be modelled were found in PRRS sero-prevalence time series.
- Potential outbreaks or excessive noise were removed applying a 95% moving quantile.

2. Prospective analysis



C. Algorithms performance evaluation

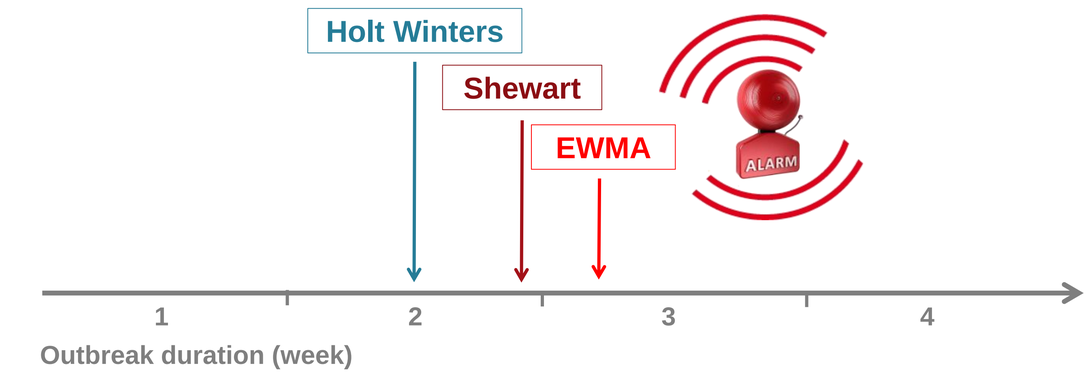
- **Sensitivity**: % of outbreaks detected from all outbreaks injected into the data.
- **False alarm rate**: proportion of weeks with false-positive alarms.
- **Average time to detection**: average time of the earliest outbreak week detected.

What did we find?

	EWMA		Shewart		Holt Winters	
Detection Limit*	2 s.d.	2.5 s.d.	2 s.d.	2.5 s.d.	0.90	0.95
Sensitivity (%)	66	58	66	61	75	75
False alarm rate	4.2	1.9	6.7	2.9	3.5	7.3

* The detection limits for EWMA and Shewart were based in standard deviations (s.d.); confidence intervals were used for Holt Winters.

Average time to detection

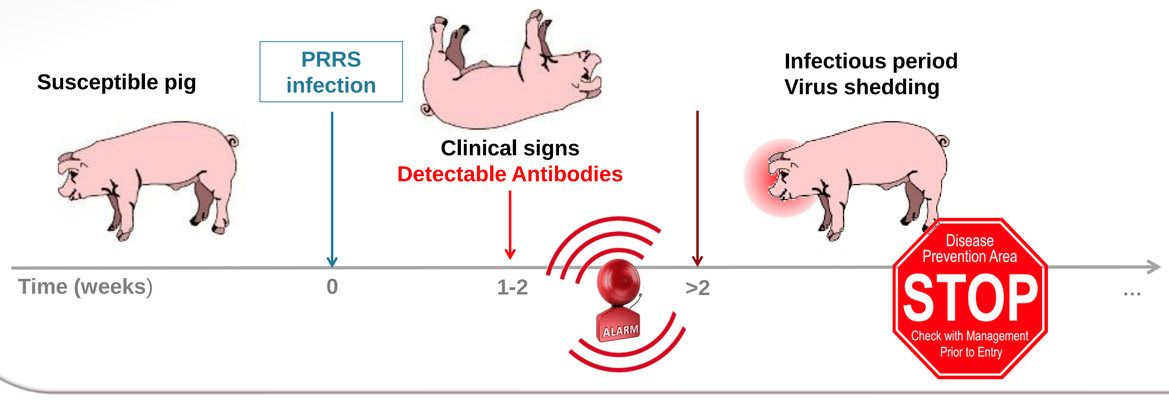


Next steps!

- Compare the performance of these algorithms on count data modelled with a Poisson model and dynamic linear models.
- Test algorithms based on outbreaks injected in 100 years simulated data with different magnitudes and shapes.

What are the perspectives?

- Development of additional spatial-temporal methods for early detection of outbreaks.
- Set up a surveillance and monitoring system in Denmark based on laboratory data.



*Corresponding author:

Ana Carolina Antunes
PhD Candidate

Phone: +45 35 88 68 58
Email: aclan@vet.dtu.dk

[1] Section for Epidemiology
National Veterinary Institute (DTU Vet)
Bülowsvej 27
1870 Frederiksberg C
Denmark

www.vet.dtu.dk

[2] Department of Disease Control and Epidemiology
National Veterinary Institute (SVA)
Ulls väg 2B
75 189 Uppsala
Sweden

www.sva.se